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Indonesia: Struggling To Climb the Technology Ladder

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An Intelligence Assessment



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May 1984*

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An Intelligence Assessment

This paper was prepared by [redacted]
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**Indonesia: Struggling
To Climb the
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Key Judgments

*Information available
as of 13 April 1984
was used in this report.*

Over the past several years, Indonesia's ambitious program to acquire a broad range of foreign technology, develop its technological base, and diversify its oil-dependent economy has produced some clear achievements:

- Jakarta is developing an aircraft plant that will be a showcase for applied industrial technology.
- Substantial strides in applying agricultural technology have increased rice production and reduced the need for imports.
- Indonesians operate, maintain, and now assemble ground stations for the Palapa satellite communications system.
- The former naval repair facility is being expanded into a shipyard that already produces small tankers and naval patrol craft.

We believe, however, that Indonesia will be unable during the next several decades to duplicate the technological success stories of Singapore, Taiwan, and South Korea and will probably be hard pressed to keep pace with Thailand and Malaysia. Shortages of equipment and qualified technical and managerial personnel, inadequate educational and physical infrastructure, and ineffective linkages between various sectors will hinder Jakarta's ambitions to climb up the technology ladder:

- Indonesia's technological development program—administered by the dynamic B. J. Habibie, Minister for Research and Technology—is highly personalized. Any successor probably could not sustain the momentum Habibie has achieved.
- Habibie's high-risk, capital-intensive approach to development is vulnerable to budget constraints. Economic stringencies resulting from the world oil glut and the global recession are making it more difficult for Jakarta to maintain the spending levels on R&D and manpower development that were possible when real GNP was growing over 7 percent annually.
- Despite government efforts to replace expatriate workers, the economy remains heavily dependent on foreign technical and managerial personnel, as well as on foreign equipment and supplies. Substantial expansion and upgrading of secondary and tertiary schooling would be needed to improve the quality of graduates before broad-based technological gains are possible.

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- Beyond this, further deterioration in Indonesia's financial situation could dramatically change Jakarta's development priorities. Industrialization based on advanced technology offers only a limited capacity to absorb Indonesia's largely unskilled and poorly educated labor force. Prolonged austerity could easily compel President Soeharto to redirect spending to social welfare and job-creating programs at the long-term expense of higher technology industries.

We believe the government's efforts at technological advance strengthen Indonesia's orientation to the West and the United States. Jakarta is vigorously courting Western governmental assistance and direct foreign investment to bolster its technological and economic development efforts.

Communist countries are also offering technical assistance as a way of improving bilateral relations. The regime's strong anti-Communist attitude, however, makes it unlikely that the government would either seek or accept substantial technical assistance from the Soviet Union or China because of the foreign presence such aid would entail.

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Indonesia: Struggling To Climb the Technology Ladder

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The Technological Offensive

Indonesia has begun an ambitious drive to move up the technology ladder. Intended to capitalize on the country's considerable natural resources, Jakarta's strategy for national technological and industrial development is still in the formative stages. We believe the strategy will follow the priorities laid out by Minister for Research and Technology B. J. Habibie, who has selected eight sectors as "vehicles" for Indonesia's development:

- *Aircraft.* The sector has high governmental priority, reflecting Habibie's aeronautical background. It is intended to be a showcase for Indonesia's technical capabilities.
- *Maritime and shipbuilding.* Habibie is upgrading ship maintenance facilities and has begun to build under license several small naval ships and tankers. Ambitious plans envision developing a major regional shipyard.
- *Defense.* Facilities formerly run by the armed services are being consolidated and expanded under Habibie. Key facilities—the Nurtanio aircraft plant, Pal shipyard, and Pindad arms plant—will also have substantial civilian manufacturing roles.
- *Land transportation.* Production of automobiles and rail rolling stock is to be developed to complement air and sea transport.
- *Telecommunications.* Jakarta is continuing its commitment to national political and economic integration by modernizing communications. The Palapa satellite system—operational since 1976—is being upgraded along with the national telephone system.
- *Energy.* Jakarta is striving to develop a domestic work force and equipment manufacturing capabilities in petroleum and gas, refining, and alternate energy sources.
- *Engineering services.* Now at a formative stage, it will be stressed to maintain and adapt capital equipment in other new industrial ventures.

- *Agricultural equipment.* Because agriculture remains the predominant sector in the economy, Jakarta intends to encourage private-sector production of cultivation, irrigation, harvesting, and processing equipment.

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Habibie's Technological Empire

We believe Indonesia's technological and industrial development program hinges in large part on the political fortunes of Habibie. For now, close personal ties to President Soeharto enhance Habibie's authority as a cabinet member and head of numerous government departments and enterprises. This and Jakarta's abundant income from oil ensure that the technology drive will remain in high gear over the near term.

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Habibie has adopted the activist entrepreneurial approach of former Pertamina President Ibnu Sutowo. As Minister for Science and Technology, he directs a small Department of Science and Technology that functions as a secretariat for coordinating policy and setting priorities among various government departments.

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Habibie's primary policy vehicle, however, is the Agency for the Development and Application of Technology (BPPT), a 900-man agency responsible directly to the President. Through BPPT, Habibie increasingly dominates or influences approximately 50 other national research institutes (see table 1).

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Established by presidential decree in 1978, BPPT is an outgrowth of the Advanced Technology Division of Pertamina, the national oil company. Its responsibilities extend beyond research to include industrial technology application, policy planning, program development and management; BPPT also plans to construct a national science and technology center (PUSPIPTEK) at Serpong, near Jakarta.

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Figure 1. B. J. Habibie, Minister of State for Research and Technology. [redacted]

Business Japan ©

Through BPPT, Habibie also is responsible for a large number of government enterprises that include aircraft assembly, shipbuilding, ordnance production, electronics manufacturing, a railway rolling stock company, and the ambitious Batam Island development project. Habibie has overall charge of defense industries and chairs an interministerial committee for weapons procurement. According to the US Embassy, Soeharto has promised Habibie eventual authority to convert one of Jakarta's two airports into an industrial park and has appointed him overseer for constructing the Navy's new headquarters base in southern Sumatra. [redacted]

We have little information on BPPT's finances, but we believe they are considerable. Habibie has indicated to US Embassy officials that he has an annual budget of \$1 billion. [redacted]

[redacted] In addition to state budget funds, BPPT receives considerable funding from Pertamina and from Soeharto's discretionary fund. With much of its funding free from the budgetary appropriation and approval process, BPPT has a considerable competitive advantage over other government departments. [redacted]

[redacted] BPPT also can exceed government salary scales, thus garnering the most qualified personnel. [redacted]

Habibie's Competition Within Government

Jakarta's technological offensive will be affected by an ongoing debate within the government over Indonesia's development priorities. Habibie's development philosophy—high-technology, capital-intensive industrialization—is at odds with Indonesia's more conservative economic technocrats. Habibie envisions an evolution away from reliance on imported technology and wants to develop projects that will showcase impressive technological products at the end of the production process. Projects must satisfy Habibie's criteria of increasing local content and meeting market demand. Habibie also believes that Indonesia should concentrate on its domestic market before looking to export. [redacted]

Jakarta's economic technocrats, we believe, are attuned to other priorities, particularly what they see as a need to pursue labor-intensive, export-oriented growth that directs investment to the village level. Unemployment among the 60-million-plus labor force is estimated to be 20 to 25 percent, and there are as many as 2 million additional entrants to the labor force each year. Accordingly, Jakarta at times has restricted technology that would increase unemployment. The government, for example, discourages the import of cigarette manufacturing equipment because each machine displaces 400 workers; in addition to a 60-percent import tariff on such machinery, the government requires manufacturers to produce two hand-rolled cigarettes for each made by machine. Although Habibie has indicated he is aware of the need to promote employment, it seems unlikely his industrialization strategy would absorb the enormous pool of low-skilled, surplus labor with which the more conservative technocrats are concerned. Meanwhile, Habibie's programs continue to draw large amounts of scarce investment capital. [redacted]

[redacted] Habibie's takeover of defense industries has met with little open opposition from the military. Some of the naval staff believe they can count on Habibie's support for purchasing advanced weapons systems because of his stress on technology. [redacted]

some senior officers resent having to defer to a civilian [redacted]

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Table 1
Indonesia: Key Research and Technology Institutions

Major Research Organizations	Remarks
Agency for the Development and Application of Technology (BPPT)	The government's primary vehicle for developing and implementing S&T policy. A 900-man agency under Minister Habibie reporting directly to the president. Through BPPT, Habibie increasingly influences national S&T, defense technology, and industrial policies.
Department of Science and Technology	Habibie's small cabinet department—staffed with only 20 to 30 personnel—which functions as a secretariat for coordinating policy and setting priorities among various government departments.
Indonesian Institute of Sciences (LIPI)	Originally responsible for research policy and program management, LIPI has lost most of its responsibilities to Habibie and BPPT. Now has only limited responsibilities for PUSPIPTEK.
National Atomic Energy Board (BATAN)	Nominally independent of BPPT but actually heavily influenced by Habibie. Responsible for running several research reactors and developing plans for an eventual power station.
National Space and Aviation Institute (LAPAN)	Responsible for rocket research. Has developed and launched several small meteorological rockets. Has an overambitious long-term program to develop surface-to-surface guided missiles, and has approached several Western countries for technology.
Central Research Institute for Food Crops (CRIFC)	A joint Indonesian-USAID project that has made major advances in developing and applying agricultural technology.
National Scientific and Technological Research Center (PUSPIPTEK)	Dubbed the "science city," it is under construction at Serpong and will be the focal point of national S&T efforts. Intended to accommodate some 700 scientists when completed in the 1990s, PUSPIPTEK will encompass 11 major research laboratories, including those for nuclear research, thermodynamics, and calibration.
Defense Research and Development Center	The Department of Defense (HANKAM) has tried to centralize military R&D, but each of the services continues to run its own research component. However, BPPT exercises increasing responsibility over defense-related research and industry. HANKAM recently formed the Technological Research Development Board to handle acquisition of foreign military technology.
Departments of Industry, Mines and Energy, Public Works, Health, Communications, Home Affairs, Social Affairs, Manpower, Environment, and Information	A relatively minor role is played by the research departments of the dozen or so ministries and departments that deal with applied technology. According to US Embassy observers, most of these groups are unproductive holding pens for personnel awaiting reassignment or considered ineffective.
Department of Education	Responsible for controlling the schools and universities.
Academic research	Conducted by major universities, primarily the University of Indonesia in Jakarta, Gaja Madah University in Jogjakarta, and the Bandung Institute of Technology. Hampered by inadequate staff, facilities, and equipment.

on defense matters—a resentment fostered by Habibie's tendency to make major decisions without consulting them.

defense production could meet increasing opposition because of the military's more immediate equipment needs. In the case of advanced fighter aircraft, for example, the military's priority is on reliable, effective equipment, whereas Habibie is concerned with eventual coproduction of aircraft.

In time, sharper differences over defense industry priorities could develop between Habibie and the military. Habibie's focus on the commercial aspects of

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Indonesia's Program for Technology Transfer

Jakarta will try to absorb foreign technology rapidly under Habibie's strategy. Since 1978 Habibie has concluded bilateral S&T cooperation agreements with the United States, West Germany, France, Japan, Spain, and Britain. In addition, he and his deputies have extensively toured Western research institutes, industrial facilities, and defense organizations, and Jakarta has sought bilateral defense industrial cooperation from the United States, Belgium, Sweden, and West Germany. The United States, Japan, Germany, and France have each assigned a science adviser to Habibie's staff. [REDACTED]

Realizing the potential economic and diplomatic gains, a number of Western countries are cultivating closer technological ties with Jakarta. France has offered to help establish thermodynamics, metallurgy and propulsion laboratories, build research vessels, and train Indonesian industrial workers. During his Jakarta visit last November, French Foreign Minister Cheysson indicated willingness to increase technology transfer, especially for industrial applications in nuclear energy, aircraft manufacture, and telecommunications. At the same time, West Germany has given substantial technical and financial assistance in recent years; in 1982 this included some \$4.2 million for laboratories and advisory assistance. For 1983 Bonn proposed \$12.8 million in technical assistance. [REDACTED]

To accelerate technological development, Jakarta is pushing foreign firms to transfer technical and managerial expertise to Indonesians by replacing some 18,000 expatriate workers with qualified nationals. Foreign companies are now required to develop a plan for training local personnel within a specified time. Foreign firms consider Jakarta's requirements among the region's strictest, and although Jakarta has compromised with foreign firms on other operating restrictions, the government shows no sign of slackening its labor rules. [REDACTED]

Jakarta has indicated keen interest in US technical assistance in energy development, mining, education, and defense industry and is vigorously courting US private investment—a point made very clear to recent delegations of US business executives. The United States has provided substantial official technological assistance, including training faculty for the Bandung

Institute of Technology and AID support for agricultural research. Recent official US assistance has included limited but well-received support in such areas as fisheries, product standards, tropical medicine, and marine cartography. The National Academy of Science (NAS) has assisted with S&T, labor and education policy planning, satellite technology, geology, and volcanology. US firms in Indonesia provide training and material aid to academic institutions, as well as extensive on-the-job training. Jakarta recently negotiated a \$15 million project with the State University of New York to train more than 300 Indonesian teachers over the next four years. [REDACTED]

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Indonesian and US officials are working out a renewal of the five-year bilateral technical assistance agreement signed in 1978. Jakarta has unrealistically high expectations, according to the US Embassy. Habibie and some of his staff reportedly envision a \$200 million program—a level the US Embassy and some of Habibie's lieutenants acknowledge is too high. Jakarta has proposed bilateral cooperation in four areas: an applied industrial technology laboratory, an electronics laboratory, training at US research and industrial facilities, and funding for NAS projects. Foreign Minister Mochtar, meanwhile, has publicly referred to US assistance in building three research laboratories—energy, electronics, and applied technology—although only one has been agreed to. [REDACTED]

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Long-Term Roadblocks to Technological Advance

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Despite modest success, we believe Indonesia's technological advance faces formidable obstacles. [REDACTED]

The Manpower Hurdle. According to a recent World Bank assessment, Indonesia's lack of qualified people is perhaps the greatest constraint to technological and economic development. US business consultants—

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citing the lack of qualified managerial and technical personnel—rate Indonesia as one of Asia's most difficult economies for local recruitment [REDACTED]

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Most workers lack even a primary education. According to the US labor attache, nearly 30 percent of the labor force has no formal education and another 37 percent did not finish primary school (see table 2). Indonesia has the lowest rate of college enrollments in

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Table 2
Educational Level of the
Indonesian Work Force

Percent

No school	29.0
Some primary school	37.1
Completed primary school	21.9
Junior high (general)	4.0
Junior high (vocational)	1.2
Senior high (general)	2.5
Senior high (vocational)	3.3
Academy	0.5
University	0.4
Not stated	0.1
Total	100.0

East Asia—only 3 percent of the college-age population are enrolled, and of those, only 9 percent are in technical or commercial programs. Industrial economists, meanwhile, rate vocational training as poor, requiring longer on-the-job training. In one recent instance, Bechtel International could recruit only about a third of the 5,600 construction workers required for a refinery project and most of them required preemployment training. [redacted]

Despite improvements in tertiary education in recent years, Indonesian universities still produce only a small proportion of the several thousand graduates needed each year. The Bandung Institute of Technology (ITB)—Indonesia's premier technical university, which produces two-thirds of all engineering graduates—turned out only 1,200 graduates in 1983. This inadequacy has a sharp impact on even priority sectors such as petroleum. For example, according to a Pertamina official, the ITB and a few other major schools graduated only 80 geologists and 35 petroleum engineers in 1981—far too few for the oil sector. Pertamina alone needed 130 geologists and 210 petroleum engineers that year. [redacted]

The ITB faculty indicates that the university is hampered in turning out more graduates by weak secondary school preparation, ill-trained faculty, and inadequate funding, even for priority items such as

books and laboratory equipment. According to US and Indonesian academics, low pay discourages many graduates from academic careers and forces faculty members to moonlight at the expense of their teaching responsibilities. The government frequently compounds the faculty shortage by commandeering qualified staff to run government projects. [redacted]

One indicator of the skill shortage is widespread pirating of the few qualified personnel. New companies trying to assemble staffs hire employees from rival firms, and turnover rates for qualified personnel—particularly at the midlevel—are high. Ironically, in-house training—essential for most firms—often contributes to high turnover as newly trained workers leave for higher pay in other companies. [redacted]

[redacted] a few industries—such as petroleum—have gentlemen's agreements not to raid one another's workers. [redacted]

The prospects for Indonesia meeting its growing demand for qualified workers are poor. The IBRD projects that the present educational system can meet only 14 percent of Indonesia's requirement for 371,000 additional technicians during this decade. Although on-the-job training could cover an additional 40 percent, nearly half the demand will go unmet without expansion of the educational system. More broadly, Asian Development Bank (ADB) experts project Indonesia will need 2.1 million professional, technical, and skilled and semiskilled workers annually during this decade to meet the objectives of its development plan. In addition, the ADB estimates a need for 12,000 agricultural technicians annually by 1990, but believes that Indonesia will produce only 5,000 per year. [redacted]

Cultural Hindrances. Social and cultural factors compound material constraints on technological progress. Indonesian academics note the Javanese cultural bias favoring the mystic over the physical world, resulting in a preference for the social sciences and the arts over technical training. A recent USAID assessment notes that secondary schools' concentration on academic courses instead of vocational programs produces too many graduates with no job-related skills and contributes to a shortage of technicians. [redacted]

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Hierarchical social patterns discourage frank intellectual exchanges and collaboration among researchers and academics who look to superiors rather than to colleagues for approval. An MIT-trained Indonesian professor attributes the low quality of most academic papers to the Javanese trait of avoiding confrontation—an attitude that stifles critical review by peers. Further, much research is never shared because academics are under little pressure to “publish or perish.”

A number of foreign manufacturers rate their Indonesian workers highly for their ability to follow directions but note a general reluctance to take the initiative. At higher levels, authorities reluctantly delegate responsibility. When ash from an erupting volcano was damaging equipment at the Nurtanio aircraft plant, for example, management waited for approval from Jakarta before shutting down the plant.

Indonesian and foreign observers also note a widespread tendency to give equipment maintenance low priority, a problem associated with the lack of qualified managers and spare parts. The frequent procurement of major equipment with little consideration for servicing, repair, or supply reduces equipment efficiency and operational life. Foreign military observers have rated the Indonesians highly on maintenance of some equipment—A-4 fighters, for example—but such cases are the exception because of poor management and training. The US air attache reports that most Air Force maintenance personnel often take 18 to 20 years to become proficient because of poor training and the lack of performance standards.

Bureaucratic Stumbling Blocks. The lack of a clear and comprehensive legal system discourages investment and technology transfer. Foreign Minister Mochtar told US Embassy officials that the absence of patent and corporate law deters some investors from considering Indonesia.

Coordination among elements in Indonesia's bureaucracy that deal with budgeting, equipment procurement, maintenance, and manpower is often poor. In the last five-year plan, for example, the Education Ministry increased funding for scientific equipment for universities but failed to budget enough for related supplies and maintenance. A piecemeal approach to equipment acquisition and to manufacturing specifications results in inefficiency and incompatibility. Indonesian academics stress the need for standards for calibration and instrumentation, but bureaucratic factionalism makes standardization difficult. BPPT's efforts to standardize the mainline railway for General Electric and General Motors locomotives, for instance, ran into Finance Ministry opposition.

US Embassy officials note that government departments act independently, withholding information from each other to protect vested interests. For example, Jakarta has failed to integrate the recently purchased Boeing 737 surveillance aircraft into the national surveillance system. The US defense attache reports that the various departments and armed services simply did not cooperate. As a result, personnel have yet to be trained to operate the radar system, and when the planes are flown, they are used to transport VIPs.

Outlook

Current efforts notwithstanding, Indonesia is unlikely to repeat the success of the East Asian newly industrializing countries (NICs)—Hong Kong, Singapore, South Korea, and Taiwan—because it lacks their infrastructure, openness to international competition, skilled and disciplined labor force, and streamlined government investment incentive packages. In fact, Indonesia will probably be hard pressed even to keep pace with Thailand and Malaysia. Although a number of US businessmen in Indonesia believe that the country's resources, size, and current efforts to develop its infrastructure and technological base could enable the country to be a major economic power in the region by the end of the century, we believe the

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low level of Indonesian technical and industrial capabilities will force Jakarta to rely heavily on foreign finance, technology, personnel, equipment, and components for the near future. Indonesia's large pool of cheap labor will be an attraction in the near term, however, to foreign firms interested in low-skill, labor-intensive operations such as electronics assembly. [REDACTED]

We believe the government recognizes many of Indonesia's shortcomings and expect corrective measures to be continued. Jakarta has given priority to vocational and technical education and plans to increase educational spending, for example. According to a UNESCO projection, overall education spending should increase from 3.6 percent of GDP in 1981 to 6 percent in 1988 to fulfill labor requirements in the government's development plan. The Education Ministry has initiated a \$40 million ADB-funded project to expand vocational education, and the Manpower Ministry has announced a \$79 million program to train 800,000 workers during 1983-84. Although these programs will help, we believe Jakarta will fall short of UNESCO's projections. [REDACTED]

The technological development strategy will also benefit higher education. Universities are now encouraged to solicit research contracts from business for their departments to reduce faculty moonlighting. The graduate faculty at ITB noted recently that for the first time the government was seeking policy recommendations from the academic community for the upcoming five-year plan. [REDACTED]

Jakarta also plans to streamline the labyrinth of licensing requirements that complicate and deter foreign investment. These efforts, however, are unlikely to make appreciable headway, and trade officials themselves are skeptical. [REDACTED]

Jakarta's ambitious plans also will be impaired by economic difficulties resulting from depressed oil prices and the global recession. Jakarta will be especially hard pressed to match the spending increases on infrastructure that were possible during the 1970s

when GNP grew 7 percent annually.¹ Last year's rescheduling of large-scale, import-intensive industrial projects valued at over \$21 billion, while fiscally sound, will slow technological development programs that depend heavily on imported capital equipment and intermediate goods. [REDACTED]

Although Habibie initially claimed that his own projects had not been hit by the cutbacks, reporting indicates that some of his operations have recently been pared, and we believe this will continue. In one instance, the Finance Ministry canceled a licensing contract with Boeing for construction of 10 hydrofoils at the PT Pal shipyard. Habibie was partially successful in salvaging an agreement for producing four with options on six more. [REDACTED]

The technical and industrial empire may face bleak prospects without Habibie. A successor probably could not wield comparable political power and maintain the institutional core Habibie has built from competing bureaucratic elements. A successor also could be less favorably inclined toward the West as a role model for Indonesia's technological development. Jakarta's aversion to Communism, however, and its economic and technological orientation toward the West make it unlikely that Jakarta would either seek or accept substantial technical assistance from the Soviet Union or China. The US Embassy reports that Soeharto recently authorized Habibie to turn down a Soviet request to discuss S&T cooperation, and Habibie reportedly declined an invitation to visit East Germany last year. [REDACTED]

¹ According to a recent CIA transnational study of LDC industrialization, investment in human resources—education, vocational training, health, and nutrition—is the most significant factor affecting an LDC's pace of industrialization because it boosts worker productivity. For instance, a US electronics firm in Indonesia found that worker productivity increased 40 percent over six months when it provided meals to its workers. Similarly, development of domestic infrastructure is a key factor in LDC industrialization by fostering economic integration and more effective resource flow. [REDACTED]

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Appendix A

P. T. Nurtanio: A Case Study

The government's infant aircraft assembly and manufacturing plant (P. T. Nurtanio) was established largely as a showcase for Indonesia's ability to master modern technology. Habibie has modeled Nurtanio after Messerschmidt-Bolkow-Blohm and drawn heavily on it for technical and personnel assistance. In addition to extensive government financial assistance, Nurtanio has received indirect support, such as a ban on competing imports and a waiver to exceed civil service pay scales [redacted]

Some foreign observers rate Nurtanio's management, facilities, and workmanship highly. [redacted]

[redacted] much of the equipment—such as the computer-controlled milling machinery—is state of the art, surpassing that of some US firms. [redacted] only Japan and Taiwan have better facilities among East Asian aircraft producers. [redacted]

[redacted] because all the sophisticated components—engines, avionics, rotor hubs, even wire and aluminum—are imported, Nurtanio really has not yet advanced beyond being a “fancy machine shop” doing metal fabrication and assembly. We share this evaluation. [redacted]

Nurtanio has made impressive gains since it was set up in 1976 and began kit assembly of MBB helicopters and a Spanish 12-passenger aircraft. It also now assembles helicopters under license from Bell Textron and Aerospatiale of France. It recently has produced a prototype of the 35-passenger turboprop CN-235 with Casa of Spain. Casa is the lead contractor in the project, but Nurtanio has been responsible for designing and building some wing and fuselage sections. The US defense attache, however, reports that structural problems have developed in the prototype which have yet to be corrected [redacted]

An ambitious expansion program is under way to increase the size of the plant from 30,000 to 220,000 square meters. Habibie has grandiose plans to expand the work force from 10,000 now to 60,000 by the year 2007. Plans include an in-house facility to train 1,000 workers per year and a \$50 million maintenance center with an increasingly sophisticated capability to service aircraft engines. Habibie eventually hopes to coproduce fighter aircraft, although he recently backed off his early enthusiasm for coproducing A-4 fighters with McDonnell-Douglas. [redacted]

Although we believe production is near capacity until more skilled workers can be trained, [redacted] Nurtanio could become a major risk-sharing partner in military and commercial coproduction by the end of the decade. They believe it would attract foreign firms because of its low labor costs—about one-fifth those in the US aircraft industry. Furthermore, Habibie intends for the plant to become a major aerospace subcontractor to firms such as Boeing and is promoting offset production in ongoing aircraft purchase negotiations with Airbus and Boeing. [redacted]

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Appendix B

Indonesia's Modernization Program: Selected Industries

Indonesia's substantial progress in developing its *oil and gas resources* has depended largely on foreign technology and expertise. Refineries and other facilities such as the Arun LNG plant in North Sumatra are "transplants," using foreign technology, equipment, and, initially, labor. []

[] despite the high priority given the petroleum sector, Indonesian technical capabilities are substandard and will require long-term reliance on outside contractors. Jakarta eventually hopes to lessen this foreign dependence by upgrading the petroleum sector labor force and by producing some of its own equipment. Habibie reportedly signed an agreement in November 1982 with Singaporean and Japanese machinery manufacturers to build an oil and gas field equipment factory. []

As in the energy sector, Jakarta has given priority to *communications technology*. The Palapa communications satellite system—built with US participation—has been operational since 1976, and the Indonesians can now operate and maintain the system of ground stations and have recently begun to assemble satellite earth stations. The US Embassy, meanwhile, reports that Jakarta has ambitious plans to expand the national *telecommunications* system during the upcoming five-year plan. Financial analysts estimated the equipment market at \$35 million in 1982, and it is expected to exceed \$200 million by 1986. Embassy

[] sources indicate that the government plans to more than double the phone system—adding as many as a million digital lines at an estimated cost of \$3 billion during the next five years—a program we believe is overly ambitious. []

Indonesia has achieved substantial gains in developing and applying *agricultural technology*. According to USAID, some 80 percent of the land growing rice now uses technology developed in recent years by the Central Research Institute for Food Crops (CRIFC), a joint US-Indonesian project. CRIFC has developed a staff capable of successful research and implementation. Their results have contributed to an increase in

Table 3
Indonesia: Major Defense-Related State Enterprises

P. T. Nurtanio	Aircraft manufacturer. The government's showcase for applied industrial technology and pet project of Minister Habibie. Produces several helicopters—largely from kits—under license from Western companies and a 12-passenger transport plane. Has ambitious plans to become a subcontractor to major aircraft manufacturers.
P. T. Pal	Former naval drydock facility at Surabaya, now under BPPT authority. Being expanded into shipyard. Produces small tankers and naval patrol craft.
P. T. Pindad	Produces some small arms, munitions, and equipment for the Army. Reportedly will be substantially expanded and will also produce civilian goods.

per capita rice production from 93 kilograms in 1968 to 137 kilograms in 1980, despite a population growth of about 35 million. []

Development of its *defense industries* is high on the list of national priorities. Habibie has placed the defense-related industries formerly run by the armed services under BPPT control and reportedly plans to consolidate them along with all major strategic industries into a broad holding company under his authority. []

In addition to P. T. Nurtanio, Indonesia's defense industries currently include:

- P. T. Pindad, the small arms and munitions plant, previously under Army management.
- P. T. Pal shipyard, formerly the Navy's drydock and repair facility.
- The air-to-surface rocket plant at Tasikmalaya, formerly Air Force run and now under the weapons system division of P. T. Nurtanio. []

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Plans reportedly include a torpedo factory, an ordnance/explosives plant, and, eventually, fighter aircraft production. Habibie claims to have presidential backing to construct 170 naval vessels ranging from small patrol craft to 20 2,000-ton destroyers by the end of the century. As in the civil sector, Jakarta is shopping around for foreign technology and assistance and is negotiating with a number of Western countries for factories, equipment, and licensing agreements. In addition to military production, a number of these facilities will have substantial civilian manufacturing roles. [redacted]

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Indonesia is seeking foreign technology in support of its infant *missile program*. The National Aeronautics and Space Institute (LAPAN) has built and launched several meteorological rockets since early 1982. [redacted]

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[redacted] LAPAN's efforts have no military significance, but support Jakarta's longer term plans to develop a surface-to-surface missile. The Indonesians are interested in a West German Aeronautics and Space Institute approach about launching its own rockets from LAPAN's West Java site. LAPAN's defense counterpart, the SISTA weapons division of P. T. Nurtanio, has a representative in the telemetry department of the West German Aeronautics and Space Institute. [redacted]

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25X1

Minister Habibie has repeatedly raised his interest in missile technology with US officials. During his 1982 US visit, he requested guidance technology and stressed his commitment to developing an Exocet-type missile for sea defense. In early 1983 he approached the US Embassy to explore acquiring surface-to-surface missile technology. [redacted]

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Secret

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